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Spectrum of Breast Lesions on Cytology with Histopathological Correlation-A Cross-Sectional Study at a Tertiary Care Hospital

Neerja H Shah[1], Hrushikesh B Surti[2]*, Atul V Shrivastav[3]

[1]Tutor, Department of Pathology, GMERS Medical College, Sola, Ahmedabad, Gujarat, India
[2]Assistant Professor, Department of Pathology, GMERS Medical College, Gandhinagar, Gujarat, India
[3]Associate Professor, Department of Pathology, GMERS Medical College, Gandhinagar, Gujarat, India

***Address for Correspondence:** Dr. Hrushikesh B Surti, Assistant Professor, Department of Pathology, GMERS Medical College, Gandhinagar, Gujarat, India
E-mail: drhbsurti@gmail.com **& ORCID ID:** https://orcid.org/0009-0002-9067-6495

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ABSTRACT

Background: Breast lesions are a significant concern in healthcare, with both benign and malignant cases frequently diagnosed. Fine Needle Aspiration Cytology (FNAC) is a minimally invasive diagnostic tool widely used for preliminary assessment. This study aims to evaluate the prevalence and trends of breast lesions, along with FNAC's diagnostic accuracy.

Methods: A total of 150 patients presenting with palpable breast lumps at C.U. Shah Medical College, Surendranagar, Gujarat, underwent FNAC, with histopathological correlation performed in 82 cases.

Results: Among the 150 patients, 111 cases (74%) were benign, while 39 cases (26%) were malignant. Malignancies were observed in 15.38% of patients below the age of 35. Histopathological correlation confirmed 96.72% of benign cases and 100% of malignant cases, demonstrating FNAC's high sensitivity (91.30%), specificity (100%), and diagnostic accuracy (97.56%).

Conclusion: FNAC is an essential diagnostic technique for breast lesions, offering high diagnostic accuracy while being minimally invasive. The shift of malignancies towards younger patients underscores FNAC's role in early detection and intervention.

Key-words: Fine Needle Aspiration Cytology, Histopathological Correlation, Palpable Breast Lump, Breast Cancer Diagnosis

INTRODUCTION

Breast tissue is highly influenced by hormonal changes, making it prone to various pathological conditions. FNAC is a widely used diagnostic modality that aids in differentiating benign from malignant breast lesions, thereby facilitating prompt clinical decision-making. It aids in avoiding unnecessary surgical intervention while enabling timely cancer diagnosis.

Breast cancer ranks among the most prevalent malignancies globally and remains a leading cause of morbidity and mortality.[1,2] In India, breast cancer accounts for a substantial proportion of cancer diagnoses with increasing incidence rates.[3,4] FNAC, in combination with the 'triple test' (clinical, radiological, and cytological findings), is a valuable tool in breast lesion diagnosis.[6] This study aims to establish the correlation between cytological and histopathological diagnoses, assessing FNAC's diagnostic accuracy through sensitivity and specificity analysis.

Breast pathology includes a wide array of conditions, from inflammatory processes to neoplastic growths, making accurate and timely diagnosis crucial. Breast lumps are one of the most common clinical presentations in women and often raise concerns about malignancy. Differentiating benign from malignant lesions at the earliest possible stage has a profound impact on patient care and prognosis. FNAC, being a simple, rapid, and cost-effective diagnostic tool, has gained widespread acceptance as a preliminary investigation for breast lumps. Its minimally invasive nature makes it patient-friendly while providing valuable cytological information that can guide clinicians in

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formulating appropriate treatment plans. The ability of FNAC to offer quick diagnostic insight is especially beneficial in busy outpatient settings and rural healthcare facilities where advanced imaging or surgical biopsies may not be readily available.

MATERIALS AND METHODS

Place of the study- This present cross-sectional observational study was conducted on 150 patients at C. U. Shah Medical College, Surendranagar, Gujarat during the period from September 2017 to August 2019.

Inclusion Criteria- Patients with adequate cellular FNAC smears where nuclear and cytoplasmic details were visible.

Exclusion Criteria- FNAC smears with inadequate cellularity or lacking ductal epithelial cells.

Methodology- Patients presenting with a palpable breast lump at the Pathology Department were enrolled in this study after obtaining informed consent. A structured proforma was completed for each participant, documenting their clinical history and physical examination findings. FNAC was performed using 22-24G needles under aseptic conditions, followed by Hematoxylin and Eosin (H&E) staining. Subsequent histopathological examination involved mastectomy and excision biopsy specimens to confirm FNAC findings.

After gross evaluation of mastectomy and excision biopsy specimens for size, shape, color, and consistency any notable changes in the nipple, skin, or lymph nodes were recorded. If signs of autolysis or necrosis were present, they were documented accordingly. Mastectomy specimens underwent overnight fixation, after which lymph nodes were dissected to assess their number and dimensions. Tissue sections were obtained from the tumor mass, margins, nipple, and lymph nodes. The samples were subjected to a standard process of dehydration, clearing, impregnation, and embedding in paraffin wax. Thin sections were then cut, stained with Hematoxylin & Eosin (H&E), and analyzed for histopathological correlation.

Statistical Analysis- Statistical analysis was conducted to evaluate the diagnostic accuracy of Fine Needle Aspiration Cytology (FNAC) by comparing cytological findings with histopathological confirmation. Sensitivity, specificity, accuracy, positive predictive value (PPV), and negative predictive value (NPV) were calculated. The results were expressed as percentages. FNAC was considered effective if it showed high sensitivity and specificity with minimal false positives and false negatives.

Ethical Considerations- Ethical Approval was obtained from the Institutional Ethics Committee of C.U. Shah Medical College, Surendranagar, Gujarat, and informed consent was taken from all participants.

RESULTS

Out of 150 cases studied cytologically, 111 (74%) cases were benign, and 39 (26%) cases were malignant. A total of 150 FNAC cases were studied, of which 82 (54.67%) had histopathological correlation. Out of 82 cases studied histopathologically, 61 (74.39%) cases were benign, and 21 (25.61%) cases were malignant. Age-wise distribution revealed highest incidence (27.33%) in the 21-30 years group (Table 1). For benign lesions, the most common age group was 21-30 years; while for malignant ones, it was 51-60 years.

Table 1: Distribution of cases according to age

Age group (Yrs)	Total cases (Percentage)	Benign	Malignant
<20	12 (8%)	12	00
21-30	41 (27.33%)	40	01
31-40	38 (25.33%)	31	07
41-50	33 (22%)	22	11
51-60	20 (13.33%)	05	15
61-70	04 (2.66%)	01	03
>70	02 (1.33%)	00	02
Total	150 (100%)	111 (74%)	39 (26%)

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The spectrum of benign lesions in FNAC included the following diagnoses. Fibroadenoma was the most common benign lesion accounting for a total of 46.85% (52 cases) of benign lesions. (Fig. 1).

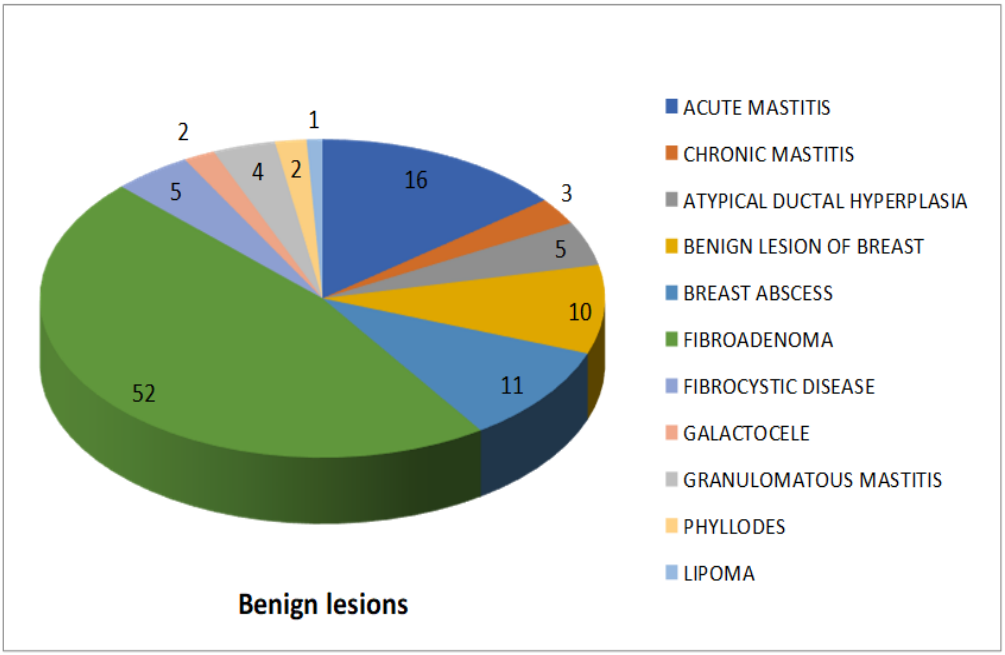

Fig. 1: Spectrum of benign lesions on FNAC (111 cases)

The spectrum of malignant lesions included the following diagnoses. Invasive ductal carcinoma (IDC) was the most common malignant lesion accounting for a total of 37 (94.87%) out of 39 malignant cases. There was one case of lobular and medullary carcinoma each. As seen from Table 2, out of a total of 150 cases studied by FNAC, 82 (54.67%) cases were correlated histopathologically. Out of 111 cases reported to be benign by cytology, histopathological correlation was obtained in 61(54.95%) cases. Of the total 39 cases found to be malignant on cytology, 21 (53.84%) cases were correlated on histopathology.

Table 2: Cytologic-Histologic Correlation of Various Breast Lesions

Cytologic Diagnosis	Histopathological Diagnosis	Total	Correlated	AM	CM	BA	FA	FAS	FCD	GCL	GM	SEB	CYST	PHY	DCIS	IDC-NOS	MC
Acute mastitis	16	7	3	3	1												
Chronic mastitis	03	2	1						1								
Atypical ductal hyperplasia	05	3			1								1	1			
Benign lesion of breast	10	3		1		2											

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	Total	Medullary carcinoma	Lobular carcinoma	Invasive ductal carcinoma	Lipoma	Phyllodes	Granulomatous mastitis	Galactocele	Fibrocystic disease	Fibroadenoma	Breast abscess
	150	1	1	37	01	02	04	02	05	52	11
	82	-	-	21	-	-	3	1	3	32	7
	(54.67%)						1				1
	5										2
	6										
	2								2	30	1
	32								1	1	1
	6							1			
	1						2				
	1										1
	4										1
	1									1	
	1										
	3			2							
	18			17							
	2			2							

AM: Acute mastitis; CM: Chronic mastitis; BA: Breast abscess; GM: Granulomatous mastitis; FA: Fibroadenoma; FAS: Fibroadenosis; FCD: Fibrocystic disease; GCL: Galactocele; SEB CYST: Sebaceous cyst; PHY: Phyllodes; DCIS: Ductal carcinoma in situ; IDC-NOS: Invasive ductal carcinoma – Not otherwise specified; MC: Medullary carcinoma

Out of 61 cases diagnosed to be benign by cytology, 59 (96.72%) cases were confirmed to be benign by histopathology and 21 cases were found to be malignant on cytology, all 21 (100%) were confirmed to be malignant on histopathology (Table 3). Thus, by FNAC, number of false positive cases was 0, while 2 cases were false negative.

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Table 3: Overall cytologic-histologic correlation (total 82 cases)

Cyto Diag	No. of case	Histopathology	No of cases	%
Benign	61	Benign	59	96.72
		Malignant	02	3.28
Malignant	21	Benign	00	00
		Malignant	21	100

On statistical analysis, sensitivity, specificity, predictive values and accuracy were derived which are shown in Table 4.

Table 4: Sensitivity, Specificity, Accuracy & Predictive value of FNAC

Parameter	Formula	Results
Sensitivity	TP(21)/TP(21)+FN(02)X100	91.30%
Specificity	TN(59)/TN(59)+FP(00)X100	100%
Accuracy	TP(21)+TN(59)/TP(21)+TN(59)+FP(0)+FN(02)X100	97.56%
Positive predictive value (PPV)	TP(21)/TP(21)+FP(0)X100	100%
Negative predictive value (NPV)	TN(59)/TN(59)+FN(02)X100	96.72%

TN: True Negative, TP: True Positive, FN: False Negative, FP: False Positive

DISCUSSION

Breast lesions constitute a major part of the overall health burden. Apart from being morbid lesions, they also affect an individual cosmetically and psychologically. In the last couple of decades, FNAC has emerged as an extremely useful tool for the initial diagnosis of breast lesions. Here we compare various parameters of FNAC with a few other studies.

Looking at the age group distribution, the trend shows a shift with increasing prevalence of breast lesions in younger age groups (Table 5). This may be because of the early diagnostic advantage offered by FNAC.

Table 5: Age-wise distribution of breast lesions

Age (yrs)	**Kanchana** *et al.* [6]	**Mahajan** *et al.* [7]	**Present study**
	No(%)	**No(%)**	**No(%)**
<20	27(15.17)	16(15.09)	12 (08.00)
21-30	54(30.33)	38(35.84)	41 (27.33)
31-40	48(26.97)	22(20.75)	38 (25.33)
41-50	30(16.85)	13(12.26)	33 (22.00)
51-60	16(8.99)	08(07.54)	20 (13.33)
61-70	3(1.69)	05(04.71)	04 (02.66)
>70	-	04(03.77)	02 (01.33)

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Two cases diagnosed as atypical ductal hyperplasia (i.e. benign on cytology) turned out to be malignant- Ductal carcinoma in situ (DCIS) and Invasive ductal carcinoma – Not otherwise specified (IDC-NOS) on histopathology. This may be caused by failure to sample from the representative area or because of inadequate material. False-negative results can be due to sampling and not to interpretive difficulties. [8]

The false negative rate was 8.69% during the present study which is quite less as compared to Feichter et al [9] and Park et al [10]. (Table 6) The false positive rate of FNAC is defined as the percentage of cases that were diagnosed to be malignant by FNAC but were proven to be benign on histopathology. In the present study, False positives were absent, further confirming FNAC's reliability.

Table 6: Comparison of the false positive and false negative results of other studies

Various studies	False Positive (%)	False Negative (%)
Feichter *et al.* [9]	0.5	9.0
Park *et al.* [10]	1.0	10.6
Present study	00.00	8.69

FNAC has gained popularity because of its high sensitivity and specificity when matched with final histopathological analysis. The present study reported a high sensitivity of 91.3 %, the highest specificity that can be recorded, i.e. 100%; accuracy, positive predictive value, and negative predictive values turned out to be 97.56%, 100% & 96.72%. When compared with other studies, the present study reported a good correlation (Table 7).

Table 7: Comparison of sensitivity, specificity, and accuracy of the FNAC in diagnosing breast lesions among other studies

Various studies	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
Ariga *et al.* [11]	98	97	99	86	-
Choi *et al.* [12]	77.7	99.2	98.4	88	-
Ahmed *et al.* [13]	85.29	100	100	98.79	-
Muhammed *et al.* [14]	90.6	100	100	99	-
Mulazim *et al.* [15]	98	100	97	100	98
Aziz *et al.* [16]	85.29	100	100	98.79	82.02
Kamphausen *et al.* [17]	90	100	100	90	-
Kanchana *et al.* [6]	87.5	100	100	97.14	97.62
Kochhar *et al.* [18]	98	100	100	97	-
Present study	91.3	100	100	96.72	97.56

PPV- Positive predictive value, NPV- Negative Predictive value

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It further confirms that FNAC is indeed a highly reliable method for the detection of breast lesions with its many advantages, especially, minimal invasiveness, less turn round time than histopathology, and high diagnostic accuracy.

CONCLUSIONS

FNAC remains a highly effective, cost-efficient, and simple diagnostic tool for the initial evaluation of breast lesions. The findings of this study confirm its high sensitivity (91.3%) and specificity (100%), along with an impressive diagnostic accuracy of 97.56%. Additionally, the study highlights a notable shift in the prevalence of breast cancer in younger age groups. With its advantages of rapid reporting and minimal invasiveness, FNAC continues to be a vital asset for clinicians, patients, and pathologists. Even in the era of advanced ancillary techniques such as immunohistochemistry and molecular diagnostics, FNAC retains its crucial role in the diagnostic approach to breast lesions.

CONTRIBUTION OF AUTHORS

Research concept- DR. NEERJA H SHAH
Research design- Dr. Neerja H Shah
Supervision- Dr Hrushikesh B Surti, Dr. Atul V Shrivastav
Materials- Dr. Neerja H Shah
Data collection- Dr. Neerja H Shah
Data analysis and Interpretation- Dr. Neerja H Shah, Dr Hrushikesh B Surti
Literature search- Dr. Neerja H Shah, Dr Hrushikesh B Surti
Writing article- Dr. Neerja H Shah, Dr Hrushikesh B Surti, Dr. Atul V Shrivastav
Critical review- Dr. Neerja H Shah, Dr Hrushikesh B Surti, Dr. Atul V Shrivastav
Article editing- Dr Hrushikesh B Surti
Final approval- Dr. Neerja H Shah, Dr Hrushikesh B Surti, Dr. Atul V Shrivastav

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